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None

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F4W

## (54) Domestic heating appliance

(57) This invention relates to a domestic heating appliance 11 having heating means and a flame effect display comprising a hologram 27 which in use provides a holographic image for the flame effect display, said image including flames. The effect of flame movement may be simulated by varying the lighting which in use will be applied to the hologram and/or by movement of the hologram.

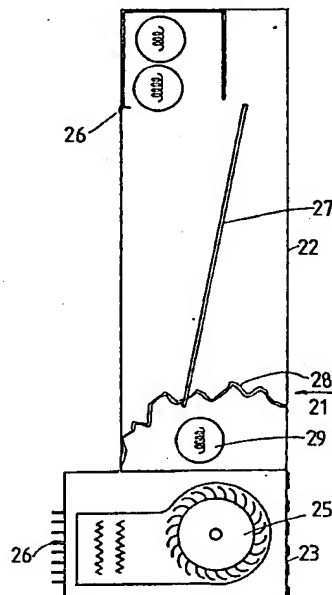


Fig. 6.

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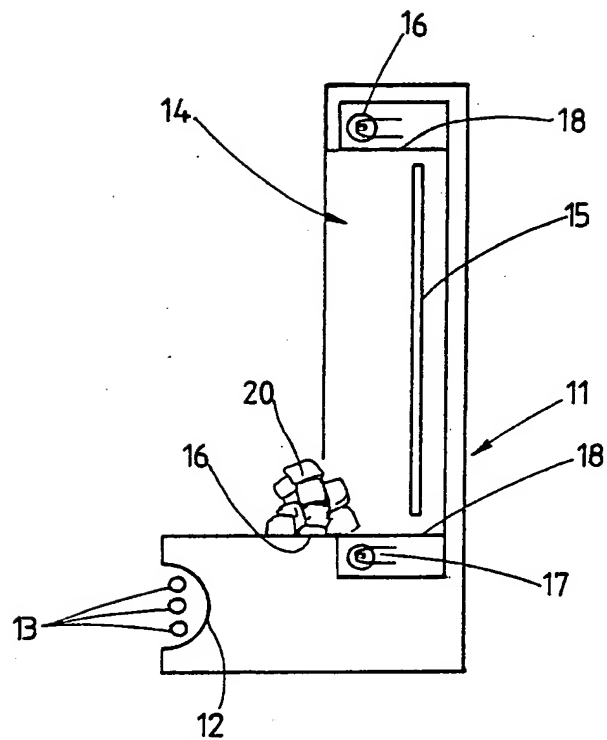


Fig. 1.

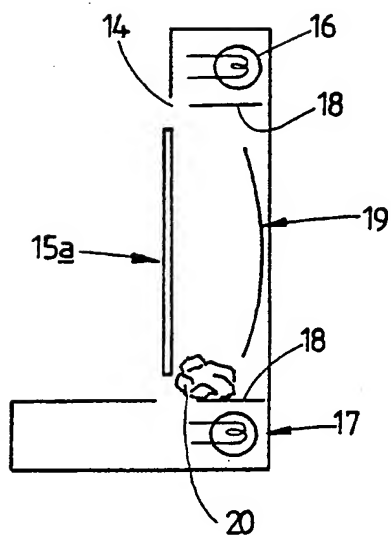


Fig. 2.

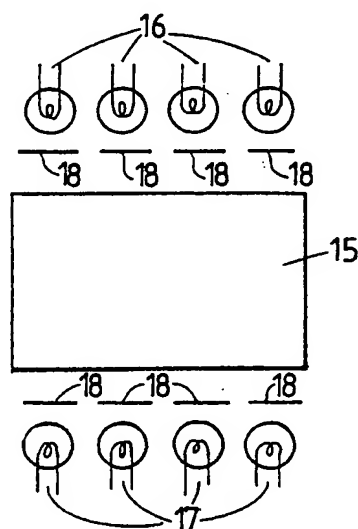


Fig. 3.

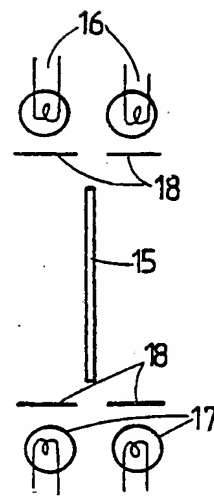


Fig. 4.

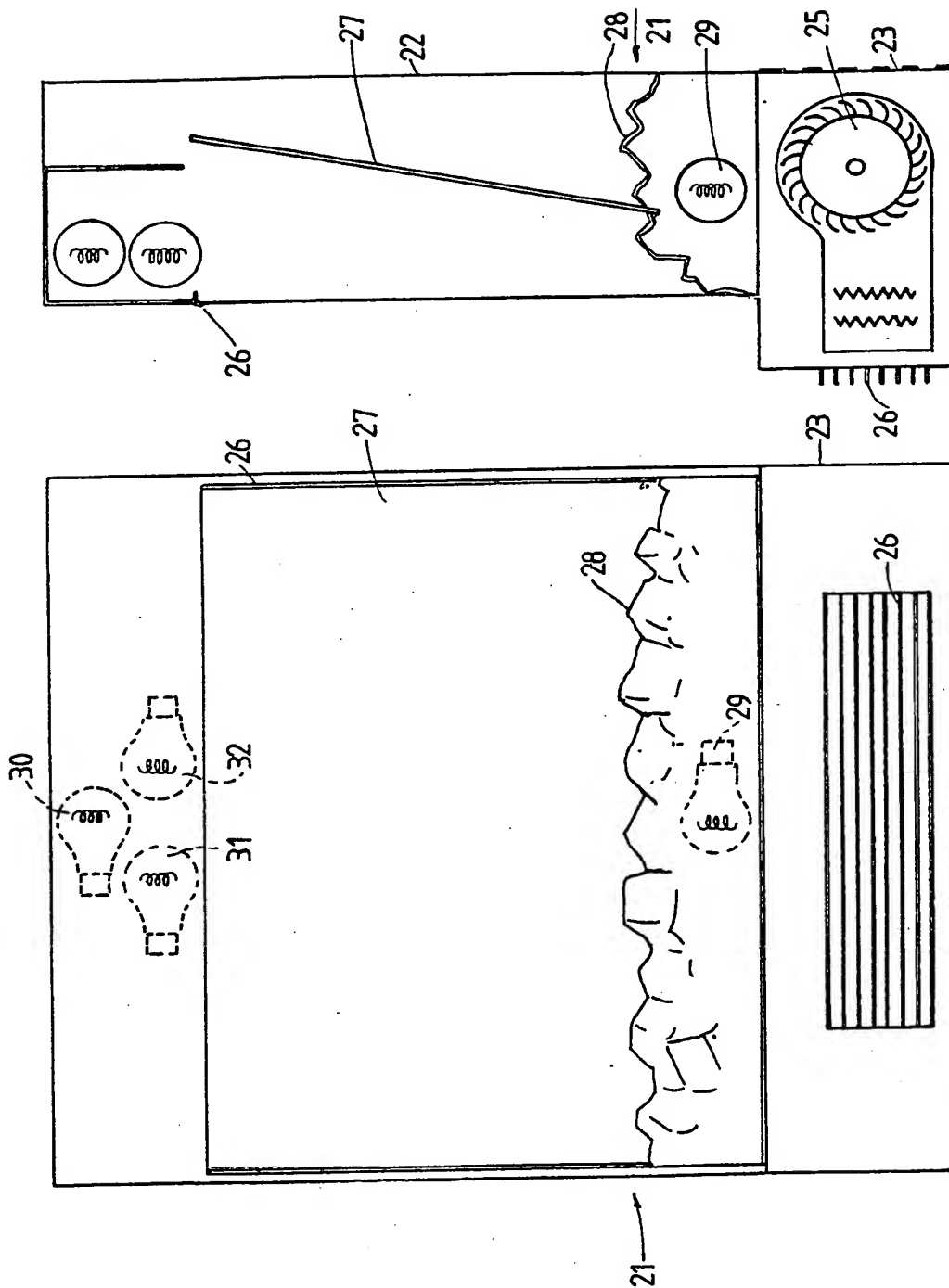


Fig. 5.

Fig. 6.

## SPECIFICATION

## Flame effect display

- 5 This invention relates to a flame effect display which may be incorporated in a domestic heating appliance, particularly, but not exclusively, an electrically powered heating appliance. This invention also relates however to a flame effect display  
10 which is intended for use on its own for example as a decorative feature.

- The term "flame effect display" is used in the art to denote the simulation of at least flame, and more usually the simulation of a coal or log fire in which  
15 flames appear to emanate from the simulated fuel at or adjacent the bottom of the display area. Thus a conventional flame effect display as used in a domestic heating appliance may be obtained by intermittent or flickering illumination of a coloured,  
20 translucent model of a wood or coal fire from within the model, or by intermittent or flickering illumination of a reflective panel positioned to the rear of a model of a fire. While such simulations are acceptable they do not approach the realism of  
25 for example some current gas fires of the type where gas burns around non-combustible simulations of coal or logs, and it is one object of the present invention to provide a domestic heating appliance having an improved flame effect display  
30 without the use of actual flame.

- In furtherance of this object, a domestic heating appliance according to one aspect of the invention includes heating means and a flame effect display, said flame effect display including a hologram  
35 which, in use, provides a holographic image of at least flames for the flame effect display.

- It is also an object of the present invention to provide an improved flame effect display and in furtherance of this object a flame effect display in  
40 accordance with another aspect of the invention includes a hologram which, in use, provides a holographic image of at least flames for the flame effect display.

- Desirably the effect of flame movement is  
45 achieved by varying the lighting applied to the hologram in either of the above-mentioned aspect of the invention.

- Conveniently the variation in the lighting may be effected by using one or more of the following expedients, i.e.  
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- a) by varying the intensity of the lighting between a minimum and a maximum which may for example be achieved (where more than one lamp is used for illuminating the hologram) by periodically switching off one or more lamps;  
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- b) by varying the angle of incidence at which the illumination strikes the hologram;
- c) by varying the colour of illumination.

- Alternatively, or in addition, the effect of flame  
60 movement is achieved by movement of the hologram.

- The hologram may be a multi-image hologram. The appliance may include a plurality of holograms, the combined holographic images of which,  
65 viewed simultaneously, or in sequence, provide the

flame effect of the display.

The invention will now be more particularly described with reference to the accompanying drawings wherein:

- 70 *Figure 1* is a diagrammatic sectional view of a domestic heating appliance in accordance with one example of one aspect of the present invention;

*Figure 2* is a view similar to *Figure 1* of a modification;

- 75 *Figure 3* is a diagrammatic front elevational view of part of the appliance shown in *Figure 1*;

*Figure 4* is a diagrammatic side elevational view of a modification.

- 80 *Figure 5* is a front elevational view of a further example of a domestic heating appliance in accordance with the invention, and

*Figure 6* is a sectional side elevational view of the appliance seen in *Figure 5*.

- Referring first to *Figure 1* of the drawings, the domestic heating appliance shown therein is a so-called 'electric fire' having a housing 11 supporting a forwardly facing reflector 12 adjacent which extend a plurality of electrically operated horizontally disposed radiant heating elements 13. Although  
85 not shown in the drawings, the housing 11 will be provided with some form of safety guard overlying the elements 13 to minimise the risk of accidental direct contact being made with the elements 13 by clothing or the like. Above the elements 13 the housing 11 defines a display area visible through a rectangular opening 14. The housing 11 surrounding the opening 14 may, if desired, be arranged to give the appearance of a conventional fireplace surrounding a fire hearth. Adjacent the rear of the display area, and extending generally vertically in use is a hologram 15. The hologram 15 is such that  
90 when lit from the front it provides a holographic image of flames. A horizontal surface 16 of the display area supports simulated coals or logs and the hologram 15 projects above the level of the simulated coals or logs 20 so that the holographic image of flames provided by the hologram 15 appears, to the observer, to emanate from the coals or logs 20.

- The hologram 15 is illuminated by lamps 16, 17 positioned within the housing 11 above and below the opening 14. The light from the lamps 16 can, if desired, pass through colour filters 18 to reach the hologram 15. It will be recognised that the hologram 15 is a reflective hologram in that the incident light does not pass through the hologram to generate the image but is reflected from the hologram.  
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- Figure 2* on the other hand illustrates an arrangement wherein a transmissive hologram 15a is substituted for the reflective hologram 15, and it can be seen that the hologram 15a is positioned in the opening 14 of the housing, and behind the hologram 15a is provided a reflector 19 for reflecting light from the lamps 16, 17 forwardly through the hologram 15a. Again the effect is that the image viewed by an observer is of flames emanating from the simulated fuel 20. It will be recognised with the above-described arrangements that the flame images will appear stationary to a stationary  
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observer. A moving observer, for example someone walking past the heating appliance, will perceive a degree of movement of the image by virtue of viewing the image from different angles. However, a more realistic image, insofar as both a stationary and a moving observer is concerned, can be achieved by varying the illumination of the hologram, irrespective of whether the hologram is of the transmissive or the reflective type. Figure 3 illustrates one example of an arrangement in which the illumination can be varied. Thus above the hologram 15 are positioned a plurality of lamps 16 and below the level of the hologram are positioned a plurality of lamps 17. In the example illustrated in Figure 3 there are four lamps 16 and four lamps 17, and the lamps of each set are spaced horizontally across the width of the hologram. Moreover, associated with each of the lamps is a respective colour filter 18.

In its simplest form, ignoring the use of filters, the simulation of movement in the flame image can be achieved by switching of the lamps of each of the sets 16, 17 individually, or in groups. Thus at one moment the hologram 15 may be illuminated by only a single one of the lamps 16, whereas immediately thereafter illumination may be by way of one or more of the lamps 17, and immediately thereafter illumination may be by way of a combination of lamps 16 and 17. It will be recognised that each of the lamps 16 and 17 affords a different direction of illumination of the hologram thereby varying the angle of incidence and giving to a stationary observer a different flame appearance. Thus switching between the various lamps which are available gives the effect of a moving flame since the image seen by the stationary observer changes with each change in lighting direction. Moreover, in addition to switching lamps on and off the effect may be enhanced by varying the intensity of illumination of some of the lamps without necessarily switching them completely off.

The lamps 16 and 17 may be controlled by a relatively simple electronic switching arrangement which can switch the lamps either in a predetermined sequence, or in a random, or pseudo-random pattern.

The introduction of filters 18 can further enhance the impression of flame movement by altering the colour in which the flame image of the hologram is illuminated. The hologram itself may have different colours for different parts of the flame image, and thus as the colour of illumination changes different parts of the flame image will become more predominant in the overall image seen by the observer.

Figure 4 shows that the upper lamps 16 and the lower lamps 17 (again with filters 18 if desired) can illuminate both the front surface of the hologram 15, and can illuminate the hologram 15 from the rear. In this instance of course the hologram 15 will be capable of operating both as a reflective hologram (in respect of the front lamps 16, 17) and as a transmissive hologram (by way of illumination from the rear lamps 16, 17). Thus there will be front and rear sets of lamps 16 and 17 for example

in the same arrangement as shown in Figure 3, and the switching mechanism controlling both the on-off switching and the intensity of the lamps will be capable of distinguishing between front and rear sets of lamps so that in certain switching conditions of the lamps 16, 17 the transmission effects of the hologram will be predominant, so far as an observer is concerned, whereas in other switching conditions the reflection effect will be predominant.

It will be understood that if desired, two or more holograms, having either the same or different images, may be incorporated in the same appliance, either side by side, or in the case of a reflective hologram used in conjunction with a transmissive hologram, the transmissive hologram may be positioned in front of the reflective hologram. Again multiple, and switchable lamps can be used in conjunction with multiple holograms to give the simulation of movement of the flame images.

It will be recognised that where a multi-colour hologram is used, then an effect of movement may be obtained without switching the or each lamp, merely by varying the colour of the light in which the hologram is illuminated. Thus it would be possible to provide a movable series of filters through which light from a single source reaches the hologram. As the light colour reaching the hologram changes then different areas of the coloured hologram will be predominant. However, the effect of movement is enhanced, as described above, by using multiple, and switched light sources.

A still further mechanism whereby a moving flame effect can be obtained is by movement of the hologram 15 itself. Thus in place of, or in addition to, the switching of multiple light sources, the hologram itself may be caused to move within the housing 11. For example, the hologram may be resiliently suspended within the housing and may be caused to move, preferably within its own plane, by means of an electrically operated solenoid or the like.

Referring now to Figures 5 and 6 there is shown therein a domestic heating appliance 21 having an upper casing 22 and a lower casing 23. The latter contains electrically energised heating means in the form of a fan heater which includes electrical heating elements 24 and a rotatable fan 25, the front of the casing 23 being formed with a grill 26 through which in use air heated by said elements 24 will be distributed by the fan 25. Alternatively instead of having a fan heater there may be provided one or more electrically energised radiant elements.

The upper casing 22 is formed in its front side with an aperture 26 in which a glass screen (preferably formed of non-reflective glass) may be fitted. Within this upper casing 22 is arranged a hologram 27 which, as will be seen in the drawings comprises a single plane member which is arranged so that it extends in a plane inclined to the vertical arranged so that the upper end of said hologram is disposed somewhat nearer to the rear of the upper casing 22 and the lower end of the hologram. The lower end of the hologram 27 in fact en-

gates a simulated fuel bed 28 which is illuminated from below by means of a lamp 29. The hologram 27 is itself illuminated by means of three lamps 30, 31 and 32, the latter two lamps being spaced horizontally apart whilst the lamp 30 is spaced vertically from the lamps 31 and 32. The tilting of the hologram 27 from the vertical plane helps to avoid unwanted reflections and the aforementioned lamps 30, 31 and 32 can be actuated to provide a varying degree of illumination on the hologram in order to provide the effect of moving flames when the hologram image is viewed by an observer standing in front of the appliance. As previously mentioned instead of varying the illumination provided by said lamps it is possible to arrange for the hologram itself to be moved. As a further alternative one lamp only may be used to illuminate the hologram and in this case an apertured disc may be arranged between the lamp and the hologram, and disc being caused to rotate in order to bring different apertures in front of the lamp so as in effect to vary the direction in which light will travel from the lamp to the hologram.

In any of the above-mentioned examples the hologram image of the desired flames can be formed in any convenient manner. Models of flames for example may be formed from fibre glass or other "wispy" material which is drawn out to simulate the flames required. Such material may be illuminated from behind or from the front or from beneath the hologram is being formed. In the various arrangements described above the or each hologram 15 is a single image hologram. However, there exists a species of hologram known as multi-image holograms in which a series of images of a moving subject is recorded on a single holographic plate. The image or images visible to an observer at any given instant is dependent upon the angle of illumination and viewing of the hologram or holographic plate, and thus by incorporating a multi-image hologram into the various arrangements described above, the simulation of flame movement can be further enhanced since not only will the angle of apparent viewing of the flame image change as the lighting changes or the hologram is moved, but also the actual image being viewed will change.

It will be recognised within the concept of using holography to produce the flame effect in a domestic heating appliance a wide variety of different hologram arrangements can be utilized. Moreover, while in each of the arrangements described above, the simulated fuel from which the flames apparently emanate is not part of the holographic image, it could be if so desired. By appropriate choice of lighting the holographic image of the fuel could be made to appear stationary notwithstanding the effect of movement in the holographic image of the flames.

Using currently available solid state switching units the switching of a series of light sources in any chosen manner can be achieved relatively simply and conveniently, in such a manner that the control arrangement can be readily incorporated into a domestic heating appliance. It will be recog-

nised that the flame effect displays described above may be applied to domestic heating appliances other than electrically powered radiant heaters.

70 The holograms may be flat, rectangular sheets or rectangular sheets which have been bent to a part cylindrical configuration. Moreover rather than being rectangular the sheets may have a shaped periphery for example a jagged flame shape may be used.

75 It is of course preferred to use holograms which are effective when illuminated by conventional lighting, for example incandescent electric lamps.

80 In the above description, reference has been made to domestic heating appliances which utilise electrically energised heating means. It is also to be understood that such domestic heating appliances may instead incorporate heating means that are adapted to burn gaseous or liquid fuel.

85 It is also to be understood that the present invention encompasses flame effect display means formed for example as above described but intended for use as decorative features without heating means.

## 90 CLAIMS

1. A flame effect display means which includes a hologram which, when illuminated, provides a holographic image of at least flames for the flame effect display.

2. A flame effect display means as claimed in Claim 1 in combination with means which together comprise a domestic heating appliance.

3. A flame effect display means as claimed in Claim 1 or Claim 2 wherein means are provided for varying the illumination which in use is applied to the hologram for the purpose of creating an effect of flame movement.

4. A flame effect display means as claimed in Claim 3 wherein said means for varying the illumination of the hologram comprises one or more of the following integers

(a) means for periodically varying the overall intensity of the illumination between a minimum and a maximum

(b) means for varying the angle of incidence at which the illumination strikes the hologram

(c) means for varying the colour of the illumination

5. A flame effect display means as claimed in anyone of Claims 1-4 wherein means are provided for effecting movement of the hologram for the purpose of creating or adding to an effect of flame movement.

6. A flame effect display means as claimed in any one of the preceding claims wherein there is provided a plurality of holograms.

7. A flame effect display means as claimed in any one of the preceding claims wherein the or each hologram is a multi-image hologram.

8. A flame effect display means as claimed in any one of the preceding claims wherein the or each hologram is tilted with respect to a vertical plane so that its upper end is disposed nearer to

the rear of the appliance than its lower end.

9. A flame effect display means as claimed in any one of the preceding claims wherein the or each hologram is formed in translucent material.

5 10. A flame effect display means as claimed in Claim 9 wherein the appliance also includes a simulated fireback which is disposed behind the hologram.

11. A flame effect display means as claimed in  
10 any one of the preceding claims wherein a plurality of lamps are provided for illuminating the hologram, the lamps being arranged so that there is a horizontal spacing between at least two of the lamps.

12. A flame effect display device as claimed in  
15 any one of the preceding claims wherein a plurality of lamps are provided for illuminating the hologram, the lamps being arranged so that there is a vertical spacing between at least two of the lamps.

20 13. A flame effect display means as claimed in any one of the preceding claims wherein there is provided an illuminated simulated fuel bed.

14. A domestic heating appliance as claimed in  
25 Claim 2 wherein said heating means comprises one or more electrically energised radiant heating elements.

15. A domestic heating appliance as claimed in  
Claim 2 wherein said heating means comprises electrically energised heating means together with  
30 fan means for distributing air heated by said heating means.

16. A domestic heating appliance as claimed in  
Claim 2 wherein said heating means comprises means for burning gaseous or liquid fuel.

35 17. A domestic heating appliance substantially as hereinbefore described with reference to and as shown in Figures 1 and 3 or Figures 2 and 4, or Figures 5 and 6 of the accompanying drawings.